# GOLDEN RATIO ASSESSMENTS OF AESTHETIC VALUE AND PROPORTION ON EXISTING MINBAR AT THE STATE MOSQUES IN JOHORE

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**Abstract:**

The minbar is an important mosque element found in the prayer hall. A range of height, width and length is available. The proportion of the minbar to the prayer hall is sometimes overlooked, diminishing the interior aesthetic value. The golden ratio is a design choice that is vital in developing the optimum product design. It is often recognised that using this ratio effectively is a terrific method to create. Thus, this study aims to apply the Golden Ratio principle to the minbar by describing the aesthetic value and interior proportion mathematically. This study determined the appropriate ratio of anthropometric elements via golden spiral template made in AutoCAD programme. When a/b equals a+b/a, the ratios equal 1.618. A total of 27 extant minbars from mosques in Johor were studied. The study's conclusions focused on the front and side elevations of the minbar's width, height, and depth. 11.1% (3 minbar) had the best proportion among the 27 components. 1.5 and 1.7 are close to the golden spiral ratio's ideal ratios. In general, the 88.9% minbar does not meet the golden ratio requirements for height, width, and weight. The Golden Ratio is used to make beautiful minbars. The proportion of mathematics related to user comfort and aesthetic appeal. The elegant design creates a safe and comfortable minbar.

**Keywords:**

Golden Ratio, Minbar, Pulpits, Proportion, Ergonomics

## Introduction

A mosque is a place of gathering of Muslims especially praying, whether alone or in a group. Praying can do in large or small numbers of members as long as the performance does the time of command. Usually, performing prayers in groups of large numbers occur on Friday afternoon or Aidil fest. The two sermons delivered by the preacher named Khatib during in these pray through climbs and stands on the platform of minbar. The preacher starts the first sermon after Zohor's call (azan) and sits briefly then begins the second sermon. The process of sermon delivery takes 15-25 minutes. Traditionally preacher stood on the minbar whilst congregation sitting on the floor finished by the carpet. All the congregation should pay attention and listen carefully to what the preacher said because it is the message from god to inviting Muslims doing good while living in the world (Othman, Inangda, & Ahmad, 2008).

Muslim prayer is a full body experience in which elements of standing, bowing, prostrating and sitting. The congregation are able sit on the floor to hear the sermon, but it provides a seat for the elderly or injured. The high-minbar platform that encourages the congregation more than ever to raise his head if he lasts 5 minutes for a long posture. Moreover, sitting on the floor may prevent congregation from maintaining the body's static position without moving as the human body is designed to move and requires movement in order to remain active and requires movement in order to remain active and flexible. The static posture tends to cause tiredness, uncomfortable and can lead to more serious problem such as back pain and faint (Sirat et al., 2011). These situations show that the mosque was not implement ergonomics features in design. Ergonomics features important to be implement in design. In addition, it becomes one of the elements covered in safety and health (Sirat et al., 2011).

In the modern context of additional technical issues, the importance of proportional systems has been lost during the design process. Designers are more concerned with the use of sustainable forms, functions, assemblies, etc., and forget that the essence of design lies in aesthetics, seemingly lacking in the importance of design planning principles. However, when the designs of the certain minbar are not fulfil congregation's requirement, it will no longer become the focal attraction to the Muslim community at the particular area. Therefore, this study attempts to find a suitable proportion for the height of the platform to suit the level of the congregation's view.

## Mosque Layout

As known as 'masjid' is the Arabic word, a place where Muslims pray five times daily and practice Islamic rituals. The design of the mosque today is the reaction idea of the transformation that has been left behind by the Prophet in 632. His mosque is square and quite simple were consisting of a sheltered prayer hall, pulpit, courtyard and main entrance also space available for the migrant or homeless. Minbar became an element of sacred furniture before the advent of the mihrab, minarate other mosque components. Nowdays, mihrab serves as a midpoint to the qibla wall axis and precedes the other spaces on a square, rectangular or octagonal the floor plan while the minbar is placed next to the mihrab space (Figure 1). Mihrab put the priest leads and peruses through the assemblage. It allows the priest to have khusyu' in pray. In the world mosques, vary form of mihrab sizes and adorned with decoration which for prayer marks the qiblah's direction to Mecca (Othman, Inangda, & Ahmad, 2008).
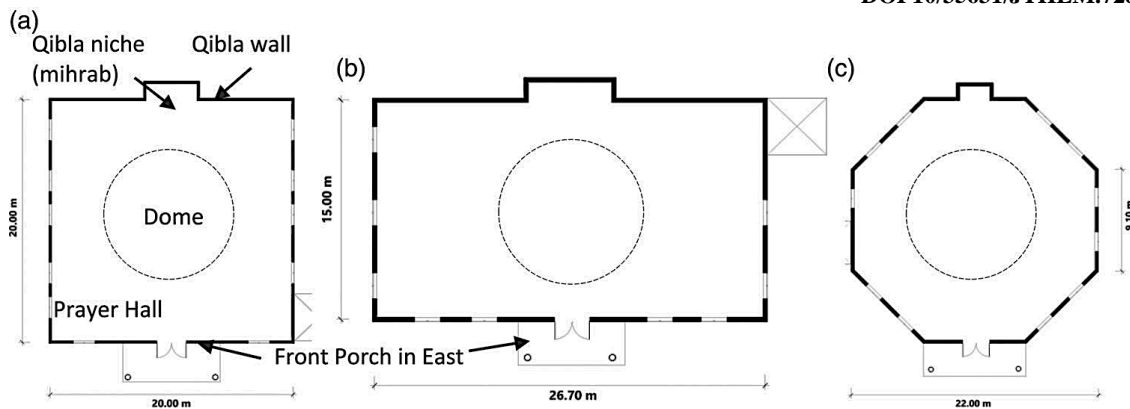
**Figure 1: Typological of mouse layout design**
Source: (Mushtaha & Helmy, 2017)

However, the original idea of the mosque's design has spread rapidly throughout the world as the expansion of Islam brought by the preacher. Prophet mosque is inspired by preachers of a new place to pray, knowledge sharing and community centre. Each world mosque currently remains the components and design elements such as the mihrab, minbar, minaret, prayer hall, ablution, verandah, dome, yard, the pattern of geometry and calligraphy (Frishman, M. M., Khan, H.-U., & al-Asad, M., 1994). Construction tradition retained and combined to reflect national architecture the roots of culture, the geography of the region, the climate, natural resources and civilization (Canizaro, V. B., 2007).

**Minbar Design Development**
At the beginning of the mosque development, the minbar is not compulsory at that time. The Prophet preached beside the palm tree if spoke too long. The next two years, there is an increasing congregation number when all over visitors came from Medina to hear his sermon. Many people began to complain that Prophet involvement was difficult to see at the rally. Therefore, a female follower offered her a pulpit so that Prophet could sit and look taller when standing up. Prophet was always preaching at the third level on the pulpit while Abu Bakr was at the second level. Later, Umar also goes down to Abu Bakr's first level. Next, Ummaiyah putting his feet on the ground and stood for six years of his rule. He rose to level three when the number of visitors to the mosque grew (Figure 2).
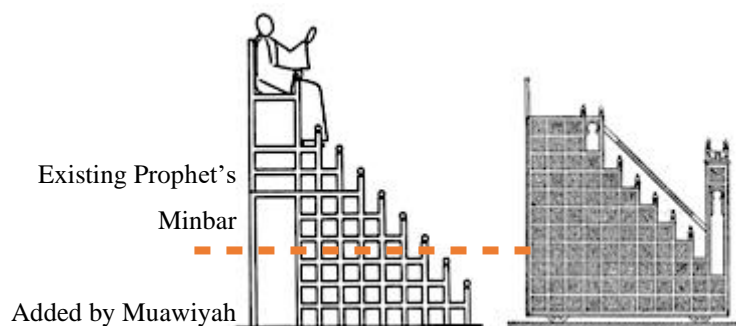


**Figure 2: (Left) Minbar of Medina, Ummaiyah Era. (Right) Minbar of Cordova Grand Mosque**
Source: https://www.academia.edu/29845563/I_minbar_su_binari_nellAfrica_del_nord_XI-XII_sec.

The minbar, which is part of the Sunnah with some belief, is usually shaped like a small tower with a prominent roof and stairs leading up to it. Then, Prophet Muhammed used only one board in three steps. While minbars look like pulp, they have roles and positions like church churches, typically used by religious ministers, priests, for broader reading and prayer. There are 4 things to consider in minbar proportion theory namely forms and size, components, placement and cultural context as following discussion (Yusof & Hassan, 2016).

The minbar was not part of the Medina mosque's in early history (Syed Ariffin, 2005). It is a separate, portable entity that leaders can carry everywhere (Tajuddin, 2007 and M. Heba, 2016). However, an earlier study of Schacht, J. (1957) found two types of minbars, namely with wheel and fixed room. Almost the entire minbars of the wheel were found to be made of wood. Ordinary of middle east minbars are rectangular in forms, front entrance, several steps and seater (Figure 2) is the sum of the first two numbers.

Platform level or floor height depends on the number of steps that customized to width or length of the prayer hall. There are no guidelines for determining the number of steps. The value of 3 is a sunnah, (refer to Muhammad minbar) but Islamic architecture is full of philosophy and the sum is a symbol of harmony and authenticity sometime steps can be 5, 7, 9 or 11 nos. However, steps can be found in a variety of styles i.e : Straight flights, L Shaped, U Shaped, Winder, Spiral and Curved.

*Minbar Anthropometrics*
Anthropometrics one of the branches of ergonomics and deals with physical measurement of the human body, such as body size, shape, strength and working capacity. Refer to Chapanis (1995) that ergonomics also synonyms to human factors and a knowledge that are related to human abilities, limitation or any other characteristics which is relevant to design. Besides, he added that ergonomic design is referred to human factors engineering, in which emphasis the word of design in its definition. In simple words, ergonomics design applies all the information related to design of any systems in which can create a safe, comfort and effective for human use.

A good minbar design should be considered and gives the Imam a level of comfort when standing while delivering a speech on the platform. The design takes into account surrounding factors such as building scale and space layout that give the area or elements full functionality (Baharudin & Ismail, 2014). Therefore, this study considers the relationship of minbars to other elements such as the large space prayer hall and the human scale. It determines the balance of the relationship between height minbars and length of space, also between height and depth. According to Helander (1997) ergonomics is a science involving design of systems and how the interaction between human and that particular system. He stated that, designed system should be ease of use, and hence the practices and procedures of use can help and organise human task or activity.

**Gold Ratio**
Gold Ratio is a mathematical ratio commonly found in nature and used in a design, fostering an organic and natural composition that looks aesthetically pleasing to the eye. It's of the proportion theories in architecture besides regulating lines, classical orders, renaissance theories, modular, ken and anthropometry. This proportion also known as Mean Golden has always existed in mathematics and in the physical universe. Euclid (365BC) refers to dividing

the dividing line at 0.6180399 .., and then invokes the use of the term "mean" in the meaning of gold. Next, Leonardo Fibonacci finds the numerical series connection to phi and Mean Golden. Followed by Leonardo Da Vinci on illustration entitled "De Divina Proportione" define all the fundamental proportions. Further, Renaissance artists used the Golden Mean of Da Vinci extensively in their paintings and statues to achieve balance and beauty. As well as Martin Ohm, the first person to use the term "gold" to describe the golden ratio through his famous book using the term "goldener schnitt" (gold section). In 1900, American mathematician Mark Barr used the Greek letter φ (phi) to define this section. Continuously, Theodore Andrea Cook later identified that proportions of what were known as gold, gold and gold ratio and Divine proportions. Debnath (2011) and Ar. Gaurav Gangwar (2017) states that the building is constructed by the dimensions derived from the ratios and mathematic constants used known as Golden Section, Golden Rectangle, Golden Triangle, Golden Spiral, Golden Proportion and also the Golden Mean. The concept of golden ratio is defined by Philisopher Plato (Ar. Gaurav Gangwar, 2017) and also represented by Greek letter φ (phi), where it is written as  or 1.618025751. Therefore, according to Salleh et.al (2014), it can be irrational number which often meet in architecture, geometry, art and other areas.

The following are some of the most known theories and concept of proportion that form the base for architectural proportion in different regions.
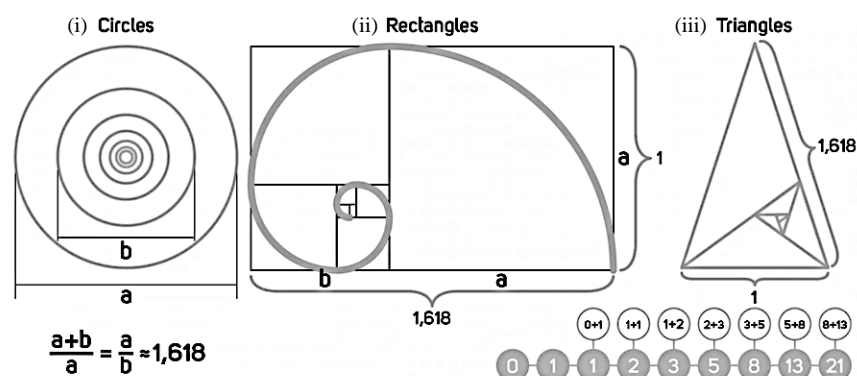


$$\frac{a+b}{a} = \frac{a}{b} \approx 1{,}618$$

**Figure 3: The Relationship Can Be Represented by The Ratio of The Circles, The Ratio of The Squares, and The Relationship of Triangles.**
Source: https://www.clevermarkstore.com/blogs/logo-design-1/golden-ratio-in-logo-design?page=2

***Proportion by Fibonacci Sequence***
The mathematics behind the golden ratio is strongly related to the Fibonacci sequence (Figure 3). It starts with a linear sequence with numbers 0, 1, and then each successive number in the sequence is the sum of the first two numbers.

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55…

The proportional system is based on the ancient Greek mathematical ratio and is seen as evidence that the universe is perfectly demonstrated in mathematics, music, and the human body. Basically, it is a unique ratio described by dividing a line into two parts where the whole length will divide by the long part to produce the ratio of long part and short part. The following are some of the most known theories and concept of proportion that form the base for architectural proportion in different regions.

*Proportion by Perfect Circles*

Many designers have mastered this technique as it can produce a golden ratio especially in logo design. Figure 3 has identified several logos that have a gold ratio where they use a circle ratio whose center line is a golden ratio, shows the perfect circle uses three concentric circles whose ratio is a: b: c: d. In the following example, a more complex version is used when the cross section is also in the same relationship. Instead, fill in the logo in various colors or represent the sun in four shades of green, yellow, green and dark green. This ray size is in a golden ratio circle. Circles used where start from the smallest followed by φ = 1.618 0339 887 ….

*Proportion by Rectangular*

Normally, the golden rectangular is the rectangular which related to the φ (Akhtaruzzaman, M., & Shafie, A. A. (2012). Besides, the ratio of the length and the width is absolutely same with the value of φ. By referring Figure 3, the golden rectangular are represent Golden ratio = a + b/a = b/a = 1.6180339887....The golden ratio is represented with capital phi and its derivative 0.618 is represented with small phi.

*Proportion by Triangle*

Golden triangle can be described in two types which is in an isosceles triangle having 72˚ degree at base and at it zenith 36˚ or 108˚ degree at apex and 36˚ at the base. The ratio between any of its base and its base and its legs has the same golden ratio value. Figure 3 shows the golden triangle and it was approximately to 1.6180339887.0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55…

**Methodology**

This case study was conducted in the state of Johor, which is located in the south. peninsula of Malaysia. This state has the largest number of mosques and is distributed in 10 districts (listed in Table 1). All mosques are monitored by the Department of Islamic Religion in Johor (JAINJ) categorized into 3 types; The State Mosque, the Qariah Mosque, and the Institution Mosque. A total of 27 state mosques were funded by the government and were selected in this study. Revisited all state mosque's minbar in this qualitative research including fieldwork such as observation, measurement, interview, and pictures. The documented data consist of overall design dimensions, length, height and width as anthropometric data on the size of the minbar. Determine the relationship between the platform floor, the number of congregation rows (safs) and the position of the rally interval at the visual rest point, the point of view and the distance are analyzed with AutoCAD to obtain the best visual results. Instead, the recorded numerical analysis will show that the offered platform floor height should be in line with the comfortable visibility distance across the platform and the congregation angle view.

**Table 1: List of 'State Mosque' Categorizes, Monitored by the Department of Islamic Religion in Johor (JAINJ).**

| Bil | Mosques Name (State) | Code | Built (Year) | Minbar Status |
|---|---|---|---|---|
| 1 | Masjid Teluk Belangah, Singapura | MTBS | *1845* 1993 | ORIGINAL (Additional main hall) |
| 2 | Masjid Sultan Abu Bakar, Jln Gertak Merah 80100 Johor Bahru | MSAB | 1900 | ORIGINAL |
| 3 | Masjid Taman Pasir Pelangi, Jln Pasir Pelangi,80050 Johor Bahru | MTPP | 1911 (1994) | ORIGINAL (Additional side hall) |

| | | | | |
|---|---|---|---|---|
| 4 | Masjid Sultan Ibrahim, Bandar Maharani, Muar | MSIBM | 1924 | ORIGINAL |
| 5 | Masjid Sultan Ibrahim, 86100 Ayer Hitam, Batu Pahat | MSIBAH | 1930 (2011) | ORIGINAL (Additional side hall) |
| 16 | Masjid Bandar Segamat, Jalan Buloh Kasap, 85000 Segamat | MBS | 1934 (2000) | ORIGINAL (Additional side hall) |
| 6 | Masjid Dato' Bentara Luar, Jalan Ampuan, 83000 Batu Pahat | MDBL | 1935 (2000) | ORIGINAL (Additional side hall) |
| 7 | Masjid Bandar Pontian, Jln Abas-Jln Alsagoff, Kg Dalam, 82000 Pontian | MBP | 1937 | ORIGINAL (Additional main hall) |
| 8 | Masjid Bandar Kluang, Jalan Sekolah, 86000 Kluang, Johor | MBK | 1940 | ORIGINAL (Additional side hall) |
| 9 | Masjid Bandar Mersing, Jalan Masjid, 86800 Mersing | MBM | 1956 | ORIGINAL |
| 10 | Masjid Bandar Kota Tinggi, Jalan Lombong Kampung Jawa Kota Tinggi Johor | MBKT | 1967 | ORIGINAL |
| 11 | Masjid At_Taqwa, Taman Pelangi, Jalan Sri Pelangi, 80400 Johor Bahru | MTPJ | 1980's | ORIGINAL (Additional side hall) |
| 12 | Masjid As-Syifa' Bandar Penawar, Jalan Kesyukuran, 81930 Bandar Penawar, Kota Tinggi, Johor | MBPK | 1992 (1997) | ORIGINAL (Additional main hall) |
| 13 | Masjid Bandar Tangkak, Jalan Hassan, 84900 Tangkak, Ledang | MBT | 1995 | ORIGINAL |
| 14 | Masjid Sultan Ismail, Jalan Bakau Condong, 83000 Batu Pahat, Johor | MSIBP | 1996 | ORIGINAL |
| 15 | Masjid Bandar Tenggara, 81440 Bandar Tenggara, Kota Tinggi, Johor | MBTG | 1997 | ORIGINAL |
| 16 | Masjid Bandar Segamat, Jalan Buloh Kasap, 85000 Segamat | MBS | 2000 | REPLACE NEW (Damage) |
| 17 | Masjid Al-Muttaqin, Sedeli Besar, 81900 Kota Tinggi, Johor | MPSB | 2001 | ORIGINAL |
| 18 | Masjid Sultan Ismail, Tanjung Agas, 84000 Ledang | MSITA | 2002 | ORIGINAL |
| 19 | Masjid Temenggong Daeng Abd Rahman, Ayer Baloi, Pontian, Johor | MDAR | 2003 | AS ORIGINAL AL |
| 20 | Masjid Tun Hussein Onn, Jalan Langkasuka, Johor Bahru | MTTHO | 2003 | ORIGINAL |
| 21 | Masjid Pekan Yong Peng, Jalan Labis, 83700 Yong Peng, Batu Pahat, Johor | MPYP | 2004 | ORIGINAL |
| 22 | Masjid Pekan Rengit, 83100 Rengit, Batu Pahat, Johor | MPR | 2005 | ORIGINAL |
| 23 | Masjid Al-Hadi, Kampung Makam, 81900 Kota Tinggi | MKMK | 2009 | ORIGINAL |
| 24 | Masjid Bandar Labis, Jalan Muar 85300 Labis, Segamat, Johor | MPL | 2010 | NEW (new mosque) |

| 25 | Masjid Kg Melayu Majidee, Jln Masjid, 81100 Johor Bahru | MKMM | 2011 | REPLACE (Damage) | NEW |
| 26 | Masjid Pekan Endau, Jalan Masjid, 86900 Mersing | MPEM | 2012 | REPLACE (Damage) | NEW |
| 27 | Masjid Kota Iskandar, Johor Bharu, Pulai, Johor, | MKIJ | 2013 | ORIGINAL | |

Source: (Author)

The measurement was compared with the suitable measurement provided in golden spiral (Proportion by Rectangular). The minbar design was fitted into this template to determine its suitable balance, aesthetic relationship between the minbar's height and width, and its geometrical shape to get the appropriate size of the minbar based on its scale (Figure 4). Figure 5 - Figure 8 below shows the golden spiral template fitted to existing measurement on the minbar with the anthropometry data labelled as a,b,c,d, and e respectively.
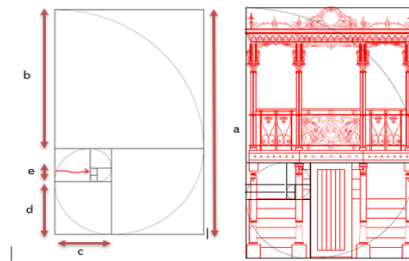


**Figure 4 : Golden Spiral Template.**
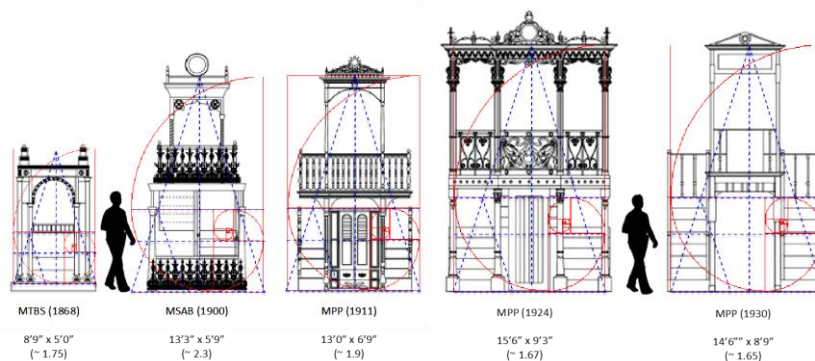
Source: (Author)



**Figure 5: Golden Ratio Assessment on Number 1 to 5 of Minbars Listed Accordingly to Table 1.**
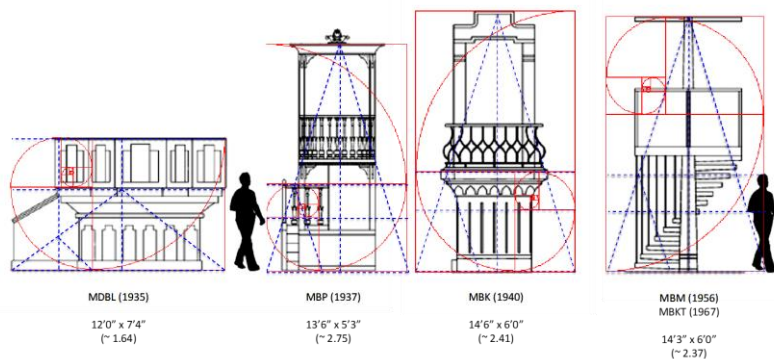
Source: (Author)

**Figure 6: Golden Ratio Assessment on Number 6 to 9 and 10 of Minbars Listed Accordingly to Table 1.**
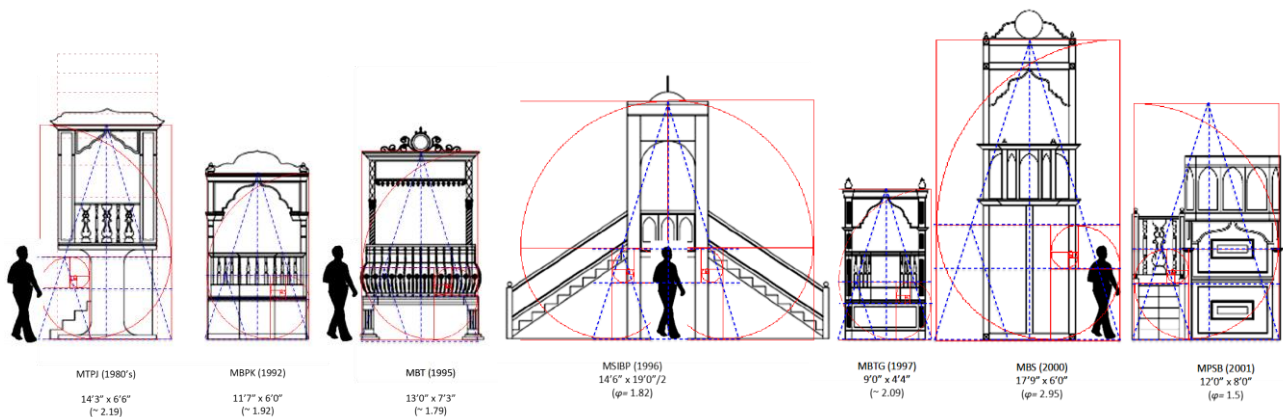
Source: (Author)



**Figure 7: Golden Ratio Assessment on Number 11 to 17 of Minbars Listed Accordingly to Table 1.**
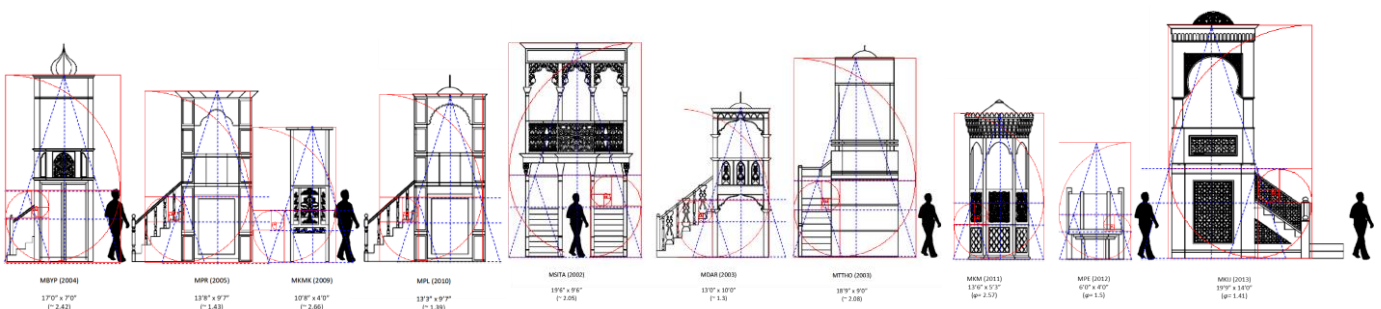
Source: (Author)



**Figure 8: Golden Ratio Assessment on Number 18 to 27 of Minbars Listed Accordingly to Table 1.**

Source: (Author)

The measurement in MDBL was the most approaching to the golden ratio compared to other four selected mosques shown in Figure 9. Besides that, the existing measurement resulting the minbar to be fits on the template of the golden spiral perfectly. This is because the difference between the existing measurement and suitable measurement provided in golden spiral was

almost similar to each other. Besides that, MSIAH and MSIBM also shown almost similar measurement when compared to suitable measurement of golden ratio.
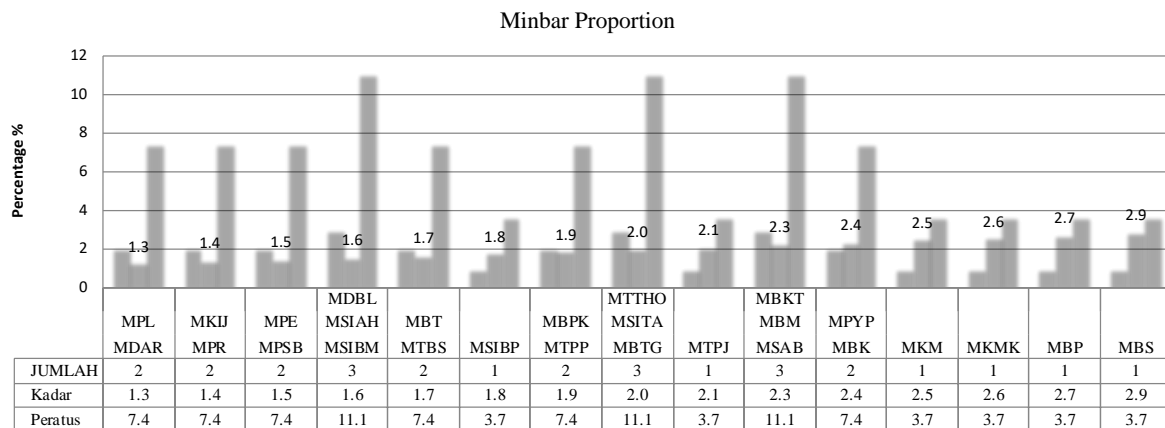


| | MPL MDAR | MKIJ MPR | MPE MPSB | MDBL MSIAH MSIBM | MBT MTBS | MSIBP | MBPK MTPP | MTTHO MSITA MBTG | MTPJ | MBKT MBM MSAB | MPYP MBK | MKM | MKMK | MBP | MBS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JUMLAH | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 |
| Kadar | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.9 |
| Peratus | 7.4 | 7.4 | 7.4 | 11.1 | 7.4 | 3.7 | 7.4 | 11.1 | 3.7 | 11.1 | 7.4 | 3.7 | 3.7 | 3.7 | 3.7 |

**Figure 9: The Graph Below Shows the Result of Minbar Proportion.**

Source: (Author)

## Conclusion

As a result of the findings, it can be stated that the congregation faced a greater angle of elevation while listening to khutba'. This research effectively accomplished the stated objective of establishing the optimal aesthetic value of proportion in minbar design. Meanwhile, to have a better understanding of the optimal golden ratio via anthropometric data on minbar design. The results indicate that the minbars at MDBL, MSIAH, and MSIBM all fit perfectly on the golden spiral (1.618), making them the most anthropometrically accurate of the four selected mosques. The golden ratio concept may have evolved as a result of the early building of the mosque. As a conclusion, the golden ratio concept may exist in structural constructions without the public being aware of it. Given the importance of the golden ratio in a variety of fields, it is not implausible that part of today's modern architecture was designed using this approach. This is because the application of this notion creates a sense of harmony, beauty, and is extremely appealing to the human eye. Despite this, the golden ratio may be employed in accordance with anthropometric data, which is critical for meeting ergonomic requirements.

## Acknowledgement

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